

What Is Claimed Is:

1. A gripper assembly for picking and placing vessels, comprising:
 - a. a cylinder having an end rim;
 - 5 b. at least two gripping member, extending from said end rim of said cylinder in a spaced-apart relationship for receiving therebetween a vessel and holding it by friction;
 - c. a piston slidably inserted inside said cylinder; and
 - 10 d. a plunger connected to and movable with said piston, and extending between said gripping members for engaging said vessel.
2. The gripper assembly of claim 1, further comprising an adapter for mounting said gripper assembly to a positioning mechanism.
3. The gripper assembly of claim 1, wherein at least one of said gripping members is made of semi-rigid flexible material.
- 15 4. The gripper assembly of claim 3, wherein said material is plastic material.
5. The gripper assembly of claim 1, wherein said gripping members each have a chamfered bottom end for receiving a misaligned vessel.
6. The gripper assembly of claim 1, further comprising pneumatic means for actuating said piston to push said plunger for releasing said vessel from said gripping members.
- 20 7. The gripper assembly of claim 6, wherein said pneumatic means actuates said piston by supplying pressurized air into said cylinder.
8. The gripper assembly of claim 1, further comprising means for detecting whether said vessel has been picked up.
- 25 9. The gripper assembly of claim 8, wherein said detecting means comprises a magnet mounted to and movable with said piston, and a sensor fixedly mounted on said cylinder for sensing magnetic field of the magnet.
10. The gripper assembly of claim 1, further comprising means for mixing the contents of said vessel while it is held by said gripping members.
- 30 11. The gripper assembly of claim 10, wherein said mixing means comprises a spin mechanism for spinning said gripper assembly.
12. A gripper assembly mounted on a positioning mechanism for picking and placing vessels, comprising:

- a. an elongated cylinder having a top end and a bottom rim;
a multiplicity of elongated gripping members with free bottom ends, the gripping members connected to said bottom rim of said cylinder in a spaced-apart relationship such that their bottom ends form a slotted expandable circular opening for receiving a vessel;
- b. a piston slidably inserted inside said cylinder;
- c. an elongated plunger connected to and movable with said piston, and extending inside said gripping members for engagement with said vessel;
- d. said gripping members holding said vessel by friction when said vessel is being transferred; and
- e. means for actuating said piston to push down said plunger for releasing said vessel from said gripping members.
13. The gripper assembly of claim 12, further comprising an adapter for mounting said gripper assembly to said positioning mechanism.
14. The gripper assembly of claim 12, wherein at least one of said gripping members is made of semi-rigid flexible material.
15. The gripper assembly of claim 14, wherein said material is plastic material.
16. The gripper assembly of claim 12, wherein said bottom ends of said gripping members are chamfered for receiving a misaligned vessel.
17. The gripper assembly of claim 12, wherein said plunger is capable of being pushed up by said vessel when said vessel is picked up by said gripping members.
18. The gripper assembly of claim 12, wherein said gripping members are capable of being slightly deflected when said vessel is inserted therebetween.
19. The gripper assembly of claim 12, wherein said actuating means is a pneumatic actuating means.
20. The gripper assembly of claim 19, wherein said pneumatic actuating means actuates said piston by supplying pressurized air into said cylinder.
21. The gripper assembly of claim 12, further comprising means for detecting whether said vessel has been picked up.

22. The gripper assembly of claim 21, wherein said detecting means comprises a magnet mounted to and movable with said piston, and a sensor fixedly mounted on said cylinder for sensing magnetic field of the magnet.
23. A method of picking and placing vessels, comprising the steps of:
- 5 a. positioning a gripper assembly at a vessel, the gripper assembly including at least two gripping members extending from a cylinder in a spaced- apart relationship, a piston slidably inserted inside the cylinder, and a plunger connected to the piston, and extending between the gripping members;
 - 10 b. picking up said vessel by moving said gripper assembly towards said vessel such that said vessel is inserted between said gripping members and pushing said plunger away, while leaving a small clearance to allow slightly further insertion of said vessel;
 - c. transferring said vessel as it is held by said gripping members by friction;
 - 15 d. placing said vessel into a seating;
 - e. seating said vessel by further moving said gripper assembly slightly towards said seating as allowed by said small clearance to ensure that said vessel is correctly seated; and
 - 20 f. releasing said vessel by moving said gripper assembly away from said seating.
24. The method of claim 23, further comprising the step of mounting said gripper assembly to a positioning mechanism for controlling the movement of said gripper assembly.
- 25 25. The method of claim 23, further comprising the step of re-positioning said gripper assembly over a new location before placing said vessel into said seating.
26. The method of claim 23, further comprising the step of positioning said gripper assembly over the same location before placing said vessel into said seating.
- 30 27. The method of claim 23, further comprising the step of moving said seating to a new location before placing said vessel into said seating.
28. The method of claim 23, further comprising the step of indexing said seating to a new location before placing said vessel into said seating.

29. The method of claim 23, further comprising the step of supplying pressurized air to said cylinder to actuate said piston.
30. The method of claim 23, wherein said gripping members each has a chamfered bottom end for receiving a misaligned vessel.
- 5 31. The method of claim 23, further comprising the step of spinning said gripper assembly to mix the content of said vessel while said vessel is transferred.
32. A method of picking and placing vessels, comprising the steps of:
- positioning a gripper assembly at a vessel seated in a seating, the gripper assembly including a plurality of gripping members extending
10 from a cylinder in a spaced-apart relationship, a piston slidably inserted inside the cylinder, and a plunger connected to the piston, and extending between the gripping members;
 - picking up said vessel from said seating by moving said gripper assembly towards said vessel such that said vessel is inserted between said gripping members and pushing said plunger away, while leaving a
15 small clearance to allow slightly further insertion of said vessel;
 - mixing the content of said vessel as it is held by said gripping members by friction;
 - placing said vessel back into said seating;
 - seating said vessel by further moving said gripper assembly slightly
20 towards said seating as allowed by said small clearance to ensure that said vessel is correctly seated; and
 - releasing said vessel by moving said gripper assembly away from said seating while actuating said piston to push said plunger which in turn
25 pushes said vessel out of said gripping members.
33. The method of claim 32, further comprising the step of mounting said gripper assembly to a positioning mechanism for controlling the movement of said gripper assembly.
34. The method of claim 32, further comprising the step of re-positioning said
30 gripper assembly over a new location before placing said vessel back into said seating.

35. The method of claim 32, further comprising the step of positioning said gripper assembly over the same location before placing said vessel back into said seating.
36. The method of claim 32, further comprising the step of moving said seating to a new location before placing said vessel back into said seating.
37. The method of claim 32, further comprising the step of indexing said seating to a new location before placing said vessel back into said seating.
38. The method of claim 32, further comprising the step of supply pressurized air to said cylinder to actuate said piston.
39. The method of claim 32, wherein said gripping members each has a chamfered bottom end for receiving a misaligned vessel.

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	